

Description

[FAN MODULE]

BACKGROUND OF INVENTION

[0001] Field of the Invention

[0002] The present invention relates to a fan module. More particularly, the present invention relates to a fan module installed inside an electronic device for moving hot air from the interior of the electronic device to the exterior.

[0003] Description of the Related Art

[0004] With great advance in computer technology, the operating speed of computers has been increased constantly so that the total amount of heat generated by electronic devices within the computer host also increases correspondingly. To prevent the internal electronic devices from temporary or permanent damage due to over-heating, an efficient cooling system must be installed inside the computer. Aside from adding a heat-dissipating system to the power supply, the central processing unit (CPU), the graphic processing unit (GPU) and the chipset of a computer to lower

the operating temperature of various electronic devices, a fan module is often installed inside the host computer. The fan module increases the heat-convection from the interior of the host computer to the exterior so that the host computer can operate smoothly. Because the space within a notebook computer is quite limited, the heat generated by various electronic devices is quickly accumulated in the air inside the computer. To dissipate the heat, a notebook computer has a fan module installed inside the host computer to carry hot air away from the interior.

[0005] Fig. 1 is a perspective view of a conventional fan module. As shown in Fig. 1, the fan module 100 is commonly installed inside a notebook computer. The fan module 100 comprises a housing 110 and a fan 120. The housing 110 has a mounting space 112, an air inlet 114 and a corresponding air outlet 116. The mounting space 112 links the air inlet 114 to the air outlet 116. When the fan 120 of the fan module 100 is in operation, air enter from the air inlet 114 and exhaust through the air outlet 116 of the housing 100. Therefore, the fan module 100 can extract hot air from the interior of the notebook computer to the exterior so that the host computer can operate smoothly.

[0006] In the conventional fan module 100, the air outlet 116 has no mesh grating for blocking material objects. Thus, when the fan module 100 is installed inside a notebook computer and carried around, small conductive objects (such as clip pins or stapler pins) having a maximum cross-dimension smaller than the air inlet 114 and the air outlet 116 can easily get into the interior of the computer via the air outlet 116, the mounting space 112 and the air inlet 114 of the housing 110. If the small conductive object happens to contact any electrical contacts or circuits inside the notebook computer by accident, a short circuit may occur leading to a mal-function. At present, the safety specification stipulates that the maximum width of any slot opening on the surface of a portable device but linked to the interior of the portable device must not exceed 1mm.

SUMMARY OF INVENTION

[0007] Accordingly, at least one objective of the present invention is to provide a fan module installed inside a portable device for extracting hot air from the interior of the portable device to the exterior.

[0008] To achieve these and other advantages and in accordance with the purpose of the invention, as embodied and

broadly described herein, the invention provides a fan module. The fan module comprises a housing, a fan and a plurality of fins. The housing further has a mounting space, an air inlet and a corresponding air outlet. The mounting space links the air inlet to the air outlet. The fan is installed within the mounting space. The fins are aligned in parallel and fitted inside the air outlet so that the fins divide the air outlet into a plurality of slots each having a width less than or equal to 1mm.

[0009] According to the embodiment of present invention, each of the slots has a width between 0.8mm and 1mm.

[0010] According to the embodiment of present invention, the longitudinal direction of the air outlet is parallel to the direction of alignment of the fins. In other words, the longitudinal direction of the air outlet is perpendicular to the longitudinal direction of the fins.

[0011] According to the embodiment of present invention, the longitudinal direction of the air outlet is perpendicular to the direction of alignment of the fins. In other words, the longitudinal direction of the air outlet is parallel to the longitudinal direction of the fins.

[0012] In brief, the fan module of present invention utilizes a series of parallel aligned fins to divide the air outlet of a

housing into a plurality of slots each having a width smaller than or equal to 1mm. The fan module cools the interior by carrying hot air inside the portable device to the exterior and the parallel-aligned fins on the air outlet of the fan module prevents the entrance of small conductive objects into the portable device via the air outlet of the housing. In other words, the fins at the air outlet of the fan module are designed to meet the safety specification related to the dimension of openings on the surface of a portable device.

[0013] It is to be understood that both the foregoing general description and the following detailed description are exemplary, and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF DRAWINGS

[0014] The accompanying drawings are included to provide a further understanding of the invention, and are incorporated in and constitute a part of this specification. The drawings illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

[0015] Fig. 1 is a perspective view of a conventional fan module.

- [0016] Fig 2A is a perspective view of an assembled fan module according to a first preferred embodiment of the present invention.
- [0017] Fig. 2B is a perspective view showing various components of a fan module according to the first preferred embodiment of the present invention.
- [0018] Fig. 3A is a perspective view of an assembled fan module according to a second preferred embodiment of the present invention.
- [0019] Fig. 3B is a perspective view showing various components of a fan module according to the second preferred embodiment of the present invention.

DETAILED DESCRIPTION

- [0020] Reference will now be made in detail to the present preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers are used in the drawings and the description to refer to the same or like parts.
- [0021] Fig.2A is a perspective view of an assembled fan module according to a first preferred embodiment of the present invention. Fig.2B is a perspective view showing various components of a fan module according to the first pre-

ferred embodiment of the present invention. Please refer to Fig.2A and Fig.2B, the fan module 201 according to the first embodiment comprises a housing 210, a fan 220 and a plurality of fins 230. The housing 210 has a mounting space 212, an air inlet 214 and a corresponding air outlet 216. The mounting space 212 links the air inlet 214 to the air outlet 216. Furthermore, the housing 210 further comprises a cover plate 210a and a base plate 210b. The air inlet 214 is a bored hole in the cover plate 210a. A portion of the sidewall of the cover plate 210a and a portion of the sidewall of the base plate 210b form the air outlet 216 in integral. The fins 230 are attached to the bottom surface of the cover plate 210a. In addition, the fan 220 is installed inside the mounting space 212. When the fan 220 rotates, air is drawn from the air inlet 214 into the mounting space 212 and then passed out through the air outlet 216. In general, the fan module 201 is installed within a portable device (such as a portable computer), and the air outlet 216 of the fan module 201 is exposed at the surface of the portable device. With this arrangement, hot air within portable device can be carried to the exterior through the fan module 201.

[0022] To meet the safety specification of a portable device, the

fins 230 are aligned in parallel and fitted inside the air outlet 216 so that the air outlet 216 is divided into a plurality of slots 216a. Furthermore, by adjusting the pitch between these fins 230, the slots 216a are set to a width smaller than or equal to 1mm to meet the safety specifications of a portable device. It should be noted that the width of the slots 216a in the first embodiment is preferably set to a value between 0.8mm and 1mm. The fins 230 are aligned in a direction (the Y-axis in Fig. 2A) parallel to the longitudinal direction of the air outlet 216 (the Y-axis in Fig. 2A). It means that the longitudinal direction (the Z-axis in Fig. 2A) of the fins 230 is perpendicular to the longitudinal direction (the Y-axis in Fig. 2A) of the air outlet 216.

[0023] When a portable device with the fan module 201 according to the first embodiment is carried out, small external conductive objects (for example, clip pins or stapler pins) is prevented from getting into the interior of the portable device through the air outlet 216 by the fins 230. In other words, if the air outlet 216 of the fan module 201 is exposed at a surface of the portable device, the fins 230 on the air outlet 216 are an effective means of preventing small conductive objects from getting into the interior of

the portable device.

[0024] Fig. 3A is a perspective view of an assembled fan module according to a second preferred embodiment of the present invention. Fig. 3B is a perspective view showing various components of a fan module according to the second preferred embodiment of the present invention. Please refer to Fig.3A and Fig.3B, the second embodiment of present invention has a fan module 202 similar to the fan module 201 in the first embodiment. The fan module 202 has a housing 210, a fan 220 and a plurality of fins 230. The fins 230 are aligned in a direction (the Z-axis in Fig. 3A) roughly perpendicular to the longitudinal direction (the Y-axis in Fig. 3A) of the air outlet 216. It means that the longitudinal direction (the Y-axis in Fig. 3A) of the fins 230 is roughly parallel to the longitudinal direction (the Y-axis in Fig. 3A) of the air outlet 216. It should be noted that the total area of the slots 216a in the second embodiment which the longitudinal direction of the fins 230 (the Y-axis in Fig. 3A) is parallel to the longitudinal direction (the Y-axis in Fig. 3A) of the air outlet 216 is greater than the total area of the slots 216a in the first embodiment. In other words, besides meeting the safety specifications of a portable device (that is, width of any

opening must be smaller than or equal to 1mm), the fan module 202 in the second embodiment also provides a larger open area for the passage of air (relative to the fan module in the first embodiment).

[0025] In summary, the fan module of present invention utilizes a plurality of parallel-aligned fins to divide the air outlet into a plurality of slots with each slot having a width smaller than or equal to 1mm. The fan module cools the interior by carrying hot air inside the portable device to the exterior and the parallel-aligned fins on the air outlet of the fan module prevents the entrance of small conductive objects into the portable device via the air outlet of the housing. Furthermore, the slots at the air outlet of the fan module are designed to meet the safety specification related to the portable device. In addition, the fan module of present invention can be applied to systems other than a notebook computer such as a tablet computer or other portable device.

[0026] It will be apparent to those skilled in the art that various modifications and variations can be made to the structure of the present invention without departing from the scope or spirit of the invention. In view of the foregoing, it is intended that the present invention cover modifications and

variations of this invention provided they fall within the scope of the following claims and their equivalents.